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METHODOLOGY

EFFECTIVENESS OF SELECTED CANNED FOOD DISPLAYS IN SUPERMARKETS

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INTRODUCTION

This report supplements Marketing Research Report 371, November 1959, in order to provide technical information on the conduct and analysis of the test. Only the highlights are presented. The experimental design and analysis presented illustrate the general type used for the tests.

EXPERIMENTAL DESIGN

The experimental design, a latin square, was selected to permit the study under controlled conditions of the influence of different methods of displaying selected canned and bottled food products.

Variation in sales from store to store or week to week makes it difficult for the retailer to conveniently and accurately measure the sales effectiveness of any selected merchandising technique. Formal testing procedures are normally required if dependable results are to be obtained. These procedures must be under normal store operating conditions, yet must be subjected to certain experimental measurements and controls. By rotating, within stores, the merchandising methods being tested according to the sequence indicated in the latin square, between store variability is eliminated from the experimental error.

Each of the four methods tested was in effect for a 2-week time period so the length of the experiment was 8 weeks. In the experiments for grapefruit juice and tomato juice and for beans and peas, the basic 4x4 latin square design was used for 3 sets of 4 stores giving a total of 12 stores in each experiment (fig. 1). For applesauce and fruit cocktail and for peaches and pineapple juice experiments, a basic 2x2 latin square design was replicated in three groups of stores; 2 stores were in each group, or a total of 6 stores in each series. The basic design was replicated twice through time. That is, the 2x2 latin square with 2-week time periods normally requires 4 weeks for a complete rotation. Therefore, the two experiments continued for 8 weeks.

This material supplements Marketing Research Report No. 371, "Effectiveness of Selected Canned Food Displays in Supermarkets."

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Fig. 1.--Experimental design for grapefruit and tomato juice (Series I), Boston, Mass., 1957 1/

Store number	April 1-13	May 13-25	June 10-22	July 22-Aug. 3
1	A - Shelf	B - Pile-on	C - Formal	D - Jumbled
2	B - Pile-on	A - Shelf	D - Jumbled	C - Formal
3	C - Formal	D - Jumbled	A - Shelf	B - Pile-on
4	D - Jumbled	C - Formal	B - Pile-on	A - Shelf
5	A - Shelf	D - Jumbled	B - Pile-on	C - Formal
6	B - Pile-on	C - Formal	A - Shelf	D - Jumbled
7	C - Formal	B - Pile-on	D - Jumbled	A - Shelf
8	D - Jumbled	A - Shelf	C - Formal	B - Pile-on
9	A - Shelf	C - Formal	D - Jumbled	B - Pile-on
10	B - Pile-on	D - Jumbled	C - Formal	A - Shelf
11	C - Formal	A - Shelf	B - Pile-on	D - Jumbled
12	D - Jumbled	B - Pile-on	A - Shelf	C - Formal

1/ Merchandising methods tested include regular shelf display in all cases. Methods B, C and D--pile-on, formal, and jumbled--represent a combination of regular shelf display with the specified type of end display. End displays were equally divided between grapefruit juice and tomato juice.

PROCEDURE 1/

The experiment was conducted in 12 food supermarkets of a New England regional chain.

The study of special displays was part of a 10-month experimental period during which time a number of other tests were also conducted. The test of special displays was divided into three different series (fig. 2).

Data were gathered under normal store operating conditions, and consumers were exposed to only one merchandising method at a time for the commodity studied.

The effect of certain other variables on the volume of sales was minimized by holding them constant throughout the experiment in all test stores.

For example, the number of facings (rows) occupied by commodities used as test items displayed on regular shelf was kept constant throughout the test. The location of the test commodities was kept constant throughout the test periods by arrangement with officials of the cooperating chain. Pricing and advertising policies for the commodity tested were uniform for all stores included in the experiment. In addition, changes in retailing procedures for competing products were likewise kept fairly uniform within these stores. Retailing practices applying both to the test and nontest commodities were coordinated in all stores.

Usually one enumerator was assigned to each store. Enumerators were responsible for maintaining the displays for a number of different experiments in the prescribed manner for each merchandising method according to the scheduled rotation. In addition, they collected records of sales of selected test and substitute items, withdrawals, and other data and obtained a cash register count of those customers potentially exposed to the merchandising methods being tested.

ANALYSIS

The analysis of variance technique was used in analyzing the data to obtain and assign the existing variation to specific components. In this study, the components were 2-week time periods, stores, merchandising methods, and experimental error, (tables 1, 3, 5, and 7). Variation existing in the "merchandising methods" component was further analyzed in the multiple comparison "t-test" (tables 2, 4, 6, and 8).

1/ Additional details on procedure are included in the section on "Procedure" in the manuscript.

Fig. 2.--Schedule for commodities on special display during a 24-week period in 12 supermarkets, Boston, Mass., 1957 1/

2-week test periods	Grapefruit juice and tomato juice (Series I)	Beans and peas (Series II)	Fruit cocktail and applesauce; pineapple juice and peaches (Series III)
April 1-13	Special display		
April 15-27		Special display	
April 29-May 11			Special display
May 13-25	Special display		
May 27-June 8		2/	Special display
June 10-22	Special display		
June 24-July 6			Special display
July 8-20		Special display	
July 22-Aug. 3	Special display		
Aug. 5-17		Special display	
Aug. 19-31			Special display
Sept. 2-14		Special display	

1/ Commodities in Series I and II were tested in 12 stores. Commodities in Series III were tested in two separate experiments using 6 stores each.

2/ Commodities in Series II were not tested during this period as originally scheduled because they were advertised at reduced prices and promoted through supplementary displays from June 3-15.

Table 1.--Analysis of variance of data on quantity of grapefruit and tomato juice sold during 8 selected weeks in 12 retail food supermarkets, Boston, Mass., 1957

Source of variation	Degrees of freedom	Mean square
Total	47	---
Groups	2	88,932
Stores within groups	9	199,501
Time within groups	(9)	15,432
Time	3	16,303
Time x groups	6	14,997
Merchandising methods within groups	(9)	109,929
Merchandising method	3	1/ 314,479
Merchandising method x group	6	7,654
Error	18	10,880

1/ The mean square with 3 degrees of freedom tested against the error mean square with 18 degrees of freedom is significant at the 5 percent probability level.

Table 2.--Multiple comparison "T-Test" of sales differences between selected merchandising methods for grapefruit juice and tomato juice, 46-ounce cans, private label brand in 12 retail food supermarkets, Boston, Mass., 1957

Methods compared 1/	Computed "t" value 2/	Probability level at which "t" value is significant 3/
B - A	6.011	.001
C - A	7.631	.001
D - A	8.325	.001
C - B	1.620	.14
D - B	2.372	.03
D - C	0.751	4/

1/ Letters A, B, C, and D represent merchandising methods as follows:
A. Regular shelf display
B. Regular shelf display and a formal "pile-on" end display.
C. Regular shelf display and a "formal basket" end display.
D. Regular shelf display and a "jumbled basket" end display.

2/ The formula for computing the "t" value is:

$$\frac{\bar{X}_B - \bar{X}_A}{S\left(\frac{1}{n_B} + \frac{1}{n_A}\right)^{\frac{1}{2}}}$$

Where B and A are the two methods compared: $\bar{X}$ is the sales mean for the method indicated, S represents error mean squared and n is the number of observations of each method.

3/ The level indicates the probability that the observed sales differences between the two methods may have been due to chance variation if the null hypothesis were true.

4/ Significant differences in sales between the two methods, if any, were not detected at the 25 percent level.

Table 3.--Analysis of variance of data on quantity of beans and peas sold during 8 selected weeks in 12 retail food supermarkets, Boston, Mass., 1957

Source of variation	Degrees of freedom	Mean square
Total	47	---
Groups	2	238,780
Stores within groups	9	271,126
Time within groups	(9)	65,499
Time	3	157,458
Time x groups	6	19,520
Merchandising methods within groups	(9)	380,594
Merchandising method	3	1/ 1,071,317
Merchandising method x groups	6	35,233
Error	18	17,782

1/ The mean square with 3 degrees of freedom tested against the error mean square with 18 degrees of freedom is significant at the 5 percent probability level.

Table 4.--Multiple comparison "t-test" of sales differences between selected merchandising methods for beans and peas, #303 cans, private label brand in 12 retail food supermarkets, Boston, Mass., 1957

Methods compared 1/	Computed "t" value 2/	Probability level at which "t" value is significant 3/
B - A	11.185	.001
C - A	10.543	.001
D - A	11.149	.001
B - C	0.643	4/
B - D	0.037	4/
D - C	0.606	4/

1/ Letters A, B, C, and D represent merchandising methods as follows:

A. Regular shelf display.
B. Regular shelf display and a formal "pile-on" end display.
C. Regular shelf display and a "formal basket" end display.
D. Regular shelf display and a "jumbled basket" end display.

2/ The formula for computing the "t" value is:

$$\frac{\bar{X}_B - \bar{X}_A}{S\left(\frac{1}{n_B} + \frac{1}{n_A}\right)^{\frac{1}{2}}}$$

Where B and A are the two methods compared: $\bar{X}$ is the sales mean for the method indicated, S represents error mean squared and n is the number of observations of each method.

3/ The level indicates the probability that the observed sales differences between the two methods may have been due to chance variation assuming the null hypothesis was true.

4/ Significant differences in sales between the two methods, if any, were not detected in this test at the 25 percent level.

Table 5.--Analysis of variance of data on quantity of pineapple juice and peaches sold during 8 selected weeks in 6 retail food supermarkets, Boston, Mass., 1957

Source of variation	Degrees of freedom	Mean square
Total	23	---
Stores	5	436,232
Time	(3)	167,737
Time between periods	1	124,849
Time within periods	2	189,182
Merchandising method	1	1/ 694
Stores x time periods	5	6,053
Merchandising methods x time periods	1	44,979
Error	8	18,472

1/ This mean square with 1 degree of freedom tested against the error mean square with 8 degrees of freedom is not significant.

Table 6.--Multiple comparison "t-test" of sales differences between selected merchandising methods for peaches, No. $2\frac{1}{2}$ cans and pineapple juice, 46-ounce cans, private label brands in 12 retail food supermarkets, Boston, Mass., 1957

Methods compared 1/	Computed "t" value 2/	Probability level at which "t" value is significant 3/
A - B.....	0.195	4/

1/ Letters A and B represent merchandising methods as follows:

A. "Formal basket" end display and regular shelf display.
B. "Formal basket" and pile-on end display and regular shelf.

2/ The formula for computing the "t" value is:

$$\frac{\overline{X_B} - \overline{X_A}}{S\left(\frac{1}{n_B} + \frac{1}{n_A}\right)^{\frac{1}{2}}}$$

Where A and B are the two methods compared: $\overline{X}$ is the sales mean for the method indicated, S represents error mean squared and n is the number of observations for each method.

3/ The level indicates the probability that the observed sales differences between the two methods may have been due to chance variation assuming the null hypothesis was true.

4/ Significant differences in sales between the two methods, if any, were not detected in this test at the 25 percent level.

Table 7.--Analysis of variance of data on quantity of applesauce and fruit cocktail sold during 8 selected weeks in 6 retail food supermarkets, Boston, Mass., 1957

Source of variation	Degree of freedom	Mean square
Total	23	---
Stores	5	68,009
Time	(3)	4,265
Time between periods	1	3,313
Time within periods	2	4,741
Merchandising method	1	1/ 2,281
Stores x time periods	5	12,749
Merchandising methods x time periods	1	38,240
Error	8	13,131

1/ The mean square with 1 degree of freedom tested against the error mean square with 8 degrees of freedom is not significant at the 5 percent probability level.

Table 8.--Multiple comparison "t-test" of sales differences between selected merchandising methods for applesauce and fruit cocktail, No. 303 cans, private label brand, in 12 retail food supermarkets, Boston, Mass., 1957

Methods compared 1/	Computed "t" value 2/	Probability level at which "t" value is significant 3/
A - B.....	0.417	4/

1/ Letters A and B represent merchandising methods as follows:

A. "Jumbled basket" end display and regular shelf display.
B. "Jumbled basket" and "pile-on" combination end display and regular shelf display.

2/ The formula for computing the "t" value is:

$$\frac{\bar{X}_B - \bar{X}_A}{S\left(\frac{1}{n_B} + \frac{1}{n_A}\right)^{\frac{1}{2}}}$$

Where A and B are the two methods compared: $\bar{X}$ is the sales mean for the method indicated, S represents error mean squared and n is the number of observations for each method.

3/ The level indicates the probability that the observed sales differences between the two methods may have been due to chance variation assuming the null hypothesis was true.

4/ Significant differences in sales between the two methods, if any, were not detected in this test at the 25 percent level.